Math SL PROBLEM SET 9

Section A (Short Answer)

1. **(F2.5, C6.1 - E) (CA)** Let $f(x) = \frac{2x-6}{1-x}$ for $x \neq 1$.   *(Cirrito 5.3.5, p144)*

    a.   For the graph of f

        i.   Find the x-intercept;

        ii.   Write down the equation of the vertical asymptote;

        iii.   Find the equation of the horizontal asymptote.

    b.   Find $\lim_{x\to\infty} f(x)$. That is, what is the "end behavior" of $f(x)$ as x gets really big?

2. **(SP5.1 - E) (CA)** The following table shows the average weights (y kg) for given heights (x cm) in a population of men. *(Oxford 10.2, p339; Oxford 10.3, p345)*

Heights (x cm)	165	170	175	180	185
Weights (y kg)	67.8	70.0	72.7	75.5	77.2

    a.   The relationship between the variables is modelled by the regression equation $y = ax + b$.

        i.   Find the value of a and b;

        ii.   Hence, estimate the weight of a man whose height is 172cm.

    b.   Write down the correlation coefficient

    c.   Which *two* of the following describe the correlation between the variables:

| Strong	Zero	Negative
Positive	No Correlation	Weak

3. **(T3.2, T3.3 - N) (CI)** Let $\sin\theta = \frac{\sqrt{5}}{3}$, where θ is *acute*. *(Cirrito 10.1.2, p316)*

    a. Which quadrant is θ in?

    b. Find $\cos(\theta)$ and $\tan(\theta)$

    c. Show that $\tan(\theta) = \dfrac{\sin(\theta)}{\cos(\theta)}$

    d. Find the value of $\sin^2(\theta) + \cos^2(\theta)$

4. **(F2.1, A1.3 - E) (CI)** Let $f(x) = (x - 5)^3$, $for\ x \in R$. *(Cirrito 5.4.2, p157; Cirrito 5.4.1, p148)*

    a. Find $f^{-1}(x)$.

    b. Let g be a function so that $(f \circ g)(x) = 8x^6$. Find $g(x)$.

    c. Expand $(x - 5)^3$.

5. **(F2.6, A1.2 - R) (CI)** Given that $2^m = 8$ and $2^n = 16$, *(Cirrito 7.1.2, p201)*

    a. Write down the value of m and n.

    b. Hence or otherwise solve $8^{2x+1} = 16^{2x-3}$.

6. **(A1.1 - N) (CA)** In an arithmetic sequence, the first term is 2 and the second term is 5. *(Cirrito 8.1.1, p241)*

    a. List the first 5 terms of this sequence.

    b. Find the common difference.

    c. Find the eighteenth term.

    d. Find the sum of the first eight terms of the sequence.

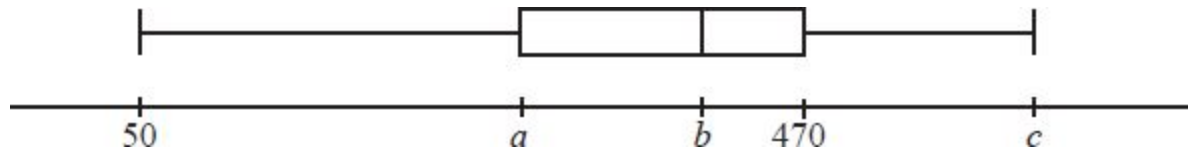## Section B (Extended Response/Investigation)

7. **(SP5.1,3 - E) (CI)** The weekly wages (in dollars) of 80 employees are displayed in the cumulative frequency curve below. *(Cirrito 13.2, 471; Oxford 8.5, p271)*
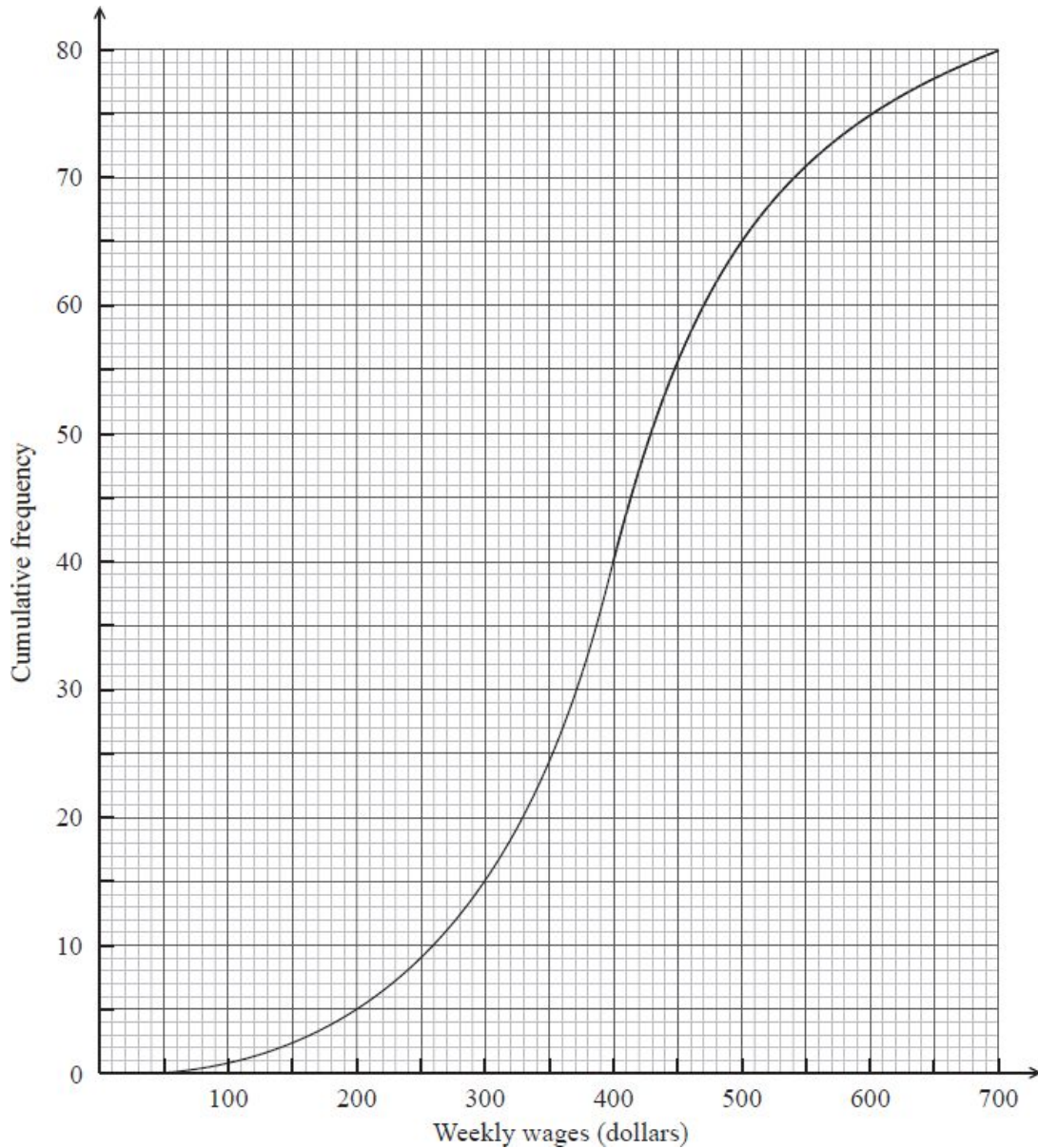
a. Find:
  i.   The weekly median wage
  ii.   The interquartile range of the weekly wages

b. The box-and-whisker plot below displays the weekly wages of the employees.

Write down the value of
  i.   a
  ii.   b
  iii. c

c. Employees are paid $20 per hour. Find the median number of hours worked per week.

d. Employees are paid $20 per hour. Find the number of employees who work more than 25 hours per week.

8. **(F2.3, F2.4 - E) (CA)** Consider the function $f(x) = x^2 - 4x + 1$. *(Cirrito 2.4.2, p44)*

a. Sketch the graph of f, for $-1 \leq x \leq 5$.

b. This function can also be written as $f(x) = (x - p)^2 - 3$. Write down the value of p.

c. The graph of g is obtained by reflecting the graph of f in the x-axis, followed by a translation of $\begin{pmatrix} 0 \\ 6 \end{pmatrix}$. Show that $g(x) = -x^2 + 4x + 5$.

d. The graphs of f and g intersect at two points. Write down the x-coordinates of these two points.

e.   A linear function, $h(x) = mx - 4$ is drawn on the same grid as $y = f(x)$. Find all possible values of m such that the line $h(x)$ and the quadratic function do not intersect.